4. Context, Scope and Role of the Remedial Action

This operable unit remedy addresses cleanup of contaminated groundwater and the containment of dissolved phase contamination surrounding non-aqueous phase liquids (NAPL), with respect to *both* the Montrose Chemical and the Del Amo Superfund Sites.[1] EPA refers to this action as a ***dual-site operable unit remedy***. The term "dual site" refers to its application to two Superfund sites within a single ROD. As an operable unit remedy, this remedy addresses only a specific portion of all contamination at the Montrose Chemical and Del Amo Superfund Sites. Overall site remedies will, and other operable unit remedies may, be selected for each of the sites. Subsequent amendments to this ROD may be on either a dual-site or site-specific basis, as determined appropriate by EPA.

This ROD establishes remedial actions and standards that differ among various areas of groundwater within the Montrose and Del Amo Sites. The ROD defines these areas both laterally and with depth (i.e. 3-dimensionally) within the system of hydrostratigraphic units present at the Joint Site[2]. This is because (1) the nature and extent of NAPL contamination has made it necessary to address contaminated groundwater that is near NAPL differently than contaminated groundwater at a greater distance from NAPL, and (2) there are physical differences among the various areas of dissolved phase contamination within the overall contaminant distribution that justify differing goals and actions. The details of these distinctions are summarized later in this ROD.

This ROD contains multiple specialized issues and approaches which require substantial discussion. As just mentioned, the ROD utilizes a dual-site approach, and selects differing actions for multiple areas of groundwater. In addition, this ROD 1) reflects only the first of two phases of remedy decisionmaking with respect to this operable unit, 2) includes a waiver of certain applicable or relevant and appropriate requirements based on technical impracticability for a defined area of groundwater, and 3) relies on more than one general response action (both intrinsic biodegradation, a form of natural attenuation, as well as hydraulic extraction and treatment) to meet remedial objectives. This section places these factors and the remedial approach being used into context so as to define the scope of the remedial action clearly and provide a contextual backdrop for the other sections of this document.

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[1]Groundwater at the Montrose Chemical and Del Amo Sites is contaminated by hazardous substances and other pollutants or contaminants as defined by Section 101 of CERCLA, 42 U.S.C. §9601, and/or listed by EPA as CERCLA hazardous substances in 40 C.F.R. Table 302.4. *See also* 40 C.F.R. §302.4.

[2]See Section 6 for formal definition of the term "Joint Site."

4.1 Dual-Site Basis and Approach

The groundwater contamination from the Montrose Chemical and Del Amo Superfund Sites has partially commingled, or merged. Originally, EPA oversaw separate remedial investigations and feasibility studies for groundwater at the two sites. However, EPA has found that factors and considerations related to evaluation of remedial alternatives and implementation of remedial actions for groundwater at these sites is inextricably related. Remedial actions taken for groundwater at one site will, to some extent, affect remedial actions taken at the other site, either by affecting the type of action taken or the manner in which the action is implemented, or both.

The groundwater contamination at these two sites presents as one interrelated technical problem. This is not to say that there are not technical distinctions worth identifying and considering between the Montrose and Del Amo Sites with respect to groundwater contamination and these have been considered by EPA, as appropriate. However, it is appropriate to frame a single remedy selection process for groundwater at the two sites. The nature and extent of contamination and the nature of the EPA Superfund remedy selection process lead to the following conclusions:

1. The implications of possible remedial actions for one site must be viewed in the context of those being considered for the other site;

2. The remedial actions for both sites must be mutually consistent; and

3. The nine remedy selection criteria in the National Contingency Plan (NCP) must not be evaluated in terms of either site alone, but in relation to the groundwater contamination from both sites as a whole.

As an example, a principal goal of the JGWFS was to evaluate the degree to which groundwater contamination at either site may be adversely moved by remedial actions being considered for the groundwater contamination at the other site. Likewise, consideration was given to whether taking certain actions for one site might affect the range or latitude of options for, or the efficacy of, addressing the other site. Such factors had to be considered together, both in time and within a single vehicle.

As another example, objectives strongly valued at one site, such as cleaning up more quickly and/or keeping existing contamination contained, bring about consideration of actions at the other site, or make some results at the other site more acceptable than they would otherwise be when considered alone. A balancing among the “site-specific” objectives is required.

Attempts to separate evaluations of remedial alternatives independently "by site" would have become artificial and awkward. The likely result of such an effort would have been two largely redundant and duplicative remedy selection processes, each with a set of reports straining to confine its evaluation of criteria within the sphere relating to one site, when the considerations needed cross site boundaries and pertain to the interrelated dual site. Such an approach also would have presented the formidable administrative risk of being either technically or administratively inconsistent and making the remedy selection process muddled or incomprehensible to the public.

Accordingly, EPA has employed a unified process of evaluation, public comment, and remedy selection to apply to this groundwater operable unit at both sites. Using a unified approach has: (1) provided for technical consistency and completeness, (2) minimized and simplified the administrative process of remedy selection, and (3) facilitated public understanding and the ability of the public to comment on the remedy when it was proposed to the public.

4.2 Site-Wide Context of This Operable Unit

Table 4-1 shows the contaminated media affected by each of the Superfund sites. The operable unit remedy selected in this ROD addresses only groundwater and NAPL, the first two items under each site in Table 4-1. EPA is conducting separate investigations and planning separate remedy selection processes for the other affected media at these sites, as shown in Table 4-1. The other affected media, and the activities being undertaken to address them, are not covered by this document or this remedy. The interim provisions of an operable unit ROD for the Del Amo Waste Pits, issued September 5, 1997, are finalized by this ROD.

4.3 The Problem Posed by NAPL at the Joint Site

The presence of NAPL contamination at both the Montrose and Del Amo sites strongly influences (1) the nature and scope of this remedy, (2) the remedial approach used in all remedial alternatives considered, and (3) the evaluation of alternatives. While more information is provided on NAPL and its distribution in later sections, a discussion is provided here to establish how NAPL relates to these contextual aspects.

At most sites where it occurs, contamination in groundwater is present in one of three forms: (1) dissolved in the water, called *the dissolved phase*; (2) adsorbed to soil particles, called *the sorbed phase*; and (3) as non aqueous phase liquid, called the *residual phase* or *NAPL phase*. Contaminant mass can be transferred among these three phases as subsurface conditions change. Generally speaking, NAPL is the presence of the pure, undissolved form of a chemical which is a liquid at standard temperature and pressure and which has a low enough water solubility that it is significantly immiscible with water and can exist as a separate phase when present in water. The

term "NAPL" does not refer to the chemical content of a substance but rather to its form. Many chemicals and mixtures of chemicals display NAPL properties but their chemical composition can only be resolved with site-specific sampling and analysis.

NAPL is usually associated with one or more of the following characteristics: (1) high interfacial tension with the water phase; (2) a density difference with the water phase; (3) movement that is dominated more by the relative saturations of NAPL/water/air, buoyancy forces, gravity and capillary pressures, rather than by hydraulic gradients, and (4) heightened viscosity. However, it is important to note that there are many chemicals for which the NAPL form is not highly viscous. An example of this is chlorinated aliphatic solvents. NAPL that has density less than the density of water is called "light non-aqueous phase liquid," or "LNAPL," and NAPL with density greater than that of water is called "dense non-aqueous phase liquid," or "DNAPL."

EPA's experience at Superfund sites is that NAPL often creates serious challenges for remedial efforts. This is because, on the one hand, it dissolves into groundwater and causes high concentrations of contaminants (up to the solubility limit) in groundwater; yet, on the other hand, complete dissolution of NAPL takes a very long period of time, and it cannot be easily flushed and removed from the aquifer. It can be exceedingly difficult to determine with a significant or reasonable degree of certainty: (1) the location of NAPL at a site, (2) the distribution of NAPL, (3) the total NAPL mass, and (4) the lowest elevation in the subsurface at which NAPL occurs ("bottom of the NAPL-contaminated zone"). NAPL can remain in the soils indefinitely, either above or below the water table, where it continually dissolves, either directly into groundwater, or into soil moisture which percolates into groundwater. In this way, NAPL represents a continuing and often recalcitrant source of dissolved phase contaminants into groundwater. Once in groundwater, the movement of the dissolved contaminants is controlled by the processes of advection, dispersion, retardation, and degradation. Figure 4-1 provides a simple depiction of this process. In order to clean groundwater when a NAPL source is present, the NAPL must either be removed, destroyed, or isolated; otherwise, continuing dissolution from the NAPL will re-contaminate groundwater which has been cleaned.

NAPL is present in many areas in the subsurface at the Montrose and Del Amo Sites, surrounded by larger areas of dissolved-phase contamination in groundwater. At these sites, NAPL is present under conditions such that it is technically impracticable with existing technologies to remove enough NAPL to reduce groundwater concentrations to health-based standards at all points in the groundwater plume. Attaining groundwater standards in the midst of the NAPL-impacted areas would require virtually complete elimination of the NAPL from the ground, which EPA has determined to be technically impracticable. This is further discussed and supported in Section 10 of this ROD.

4.4 Use of a Containment Zone for NAPL

This operable unit remedy isolates the NAPL within a ***containment zone***.[3] The containment zone includes both NAPL and some dissolved phase contamination surrounding the NAPL. Dissolved phase contaminants within the containment zone will be prevented from escaping the containment zone by the remedial actions selected by this ROD. These actions thereby isolate the NAPL and the dissolved phase contamination *inside* the containment zone, from the dissolved phase contamination and clean groundwater *outside* the containment zone. The size of the containment zone is limited in size based on technical principles (discussed in Section 10 of this ROD and Appendix E of the JGWFS).

NAPL dissolution continues to occur within the containment zone, therefore, concentrations of contaminants within the containment zone cannot be appreciably reduced; the containment zone must be contained indefinitely. However, once the containment zone is established, the dissolved phase contamination *outside* the containment zone can be cleaned up to health-based standards because NAPL dissolution no longer effects the groundwater outside the containment zone. All alternatives that EPA considered prior to selecting this remedy (except for the No Action Alternative) assumed that NAPL was isolated within a containment zone in this way. This concept is depicted in Figure 4-2.

Two means are utilized within this ROD for achieving containment of dissolved phase contaminants within the containment zone: (1) hydraulic extraction and treatment, and (2) reliance on intrinsic biodegradation. The application of these means vary depending on the area of groundwater being addressed. This is further discussed in Sections 11 and 12 of this ROD with Sections 7, 9 and 10 providing significant supporting information.

4.5 Two Phases of Remedy Selection to Address Groundwater and NAPL

This operable unit remedy represents the first of *two* phases of remedy selection that will address groundwater and NAPL at these sites. This first phase establishes a containment zone and addresses dissolved phase contamination. More specifically, this phase:

[3]The use of the term "containment zone" in this ROD does not reflect a formal establishment of a containment zone as that term is used in, and per the requirements of, California State Water Resources Control Board Resolution No. 92-49(III)(H).

(1) ***Contains dissolved phase contaminants in groundwater surrounding the NAPL*** in a containment zone, thereby isolating the NAPL principal threat and the contaminated groundwater immediately surrounding it from the groundwater outside the containment zone; and

(2) Outside the containment zone, ***reduces dissolved phase concentrations*** of contaminants in groundwater to health-based standards and in accordance with the specifications in this ROD.

The second phase of remedial selection for this operable unit will address whether and to what degree ***NAPL Recovery*** and/or ***NAPL immobilization*** shall occur at the Montrose and Del Amo Sites. This distinction between the two phases is further described as follows.

It is important to make certain distinctions between the dissolved phase and the NAPL phase in order to put the two phases of remedial selection into context. While it addresses NAPL by isolating it within an area of groundwater, this first phase remedial action does *not* address ***NAPL recovery***, which refers to removing the NAPL itself from the ground. The action selected by this ROD, therefore, does not significantly affect the mass of NAPL remaining in the ground.

Also, the actions selected in this ROD prevent the migration of dissolved phase contaminants *in the water surrounding the NAPL,* but do not prevent the migration of the NAPL phase itself. While this ROD requires that the remedial action be designed to prevent or limit *inducing* the movement of NAPL, a certain degree of NAPL movement may occur naturally. EPA has determined that this remedy is protective of human health and the environment. However, the potential for movement of the NAPL phase itself in the future, as well as the lingering mass of NAPL, creates uncertainty with respect to the long-term effectiveness of the remedial actions selected in this ROD, and the ability of those actions to maintain protectiveness of human health and the environment over the long term. To address these uncertainties, EPA is performing a second phase of remedial decisionmaking for this groundwater operable unit.

Some degree of NAPL recovery and/or immobilization of NAPL would likely enhance the long-term effectiveness and certainty of long-term protectiveness of the first phase remedial actions selected by this ROD. When NAPL is recovered from the ground, its mass and saturation are reduced. In principle, this can (1) reduce the amount of time that the containment zone must be maintained, (2) reduce the potential for NAPL to move naturally either vertically or laterally, and (3) increase the long-term certainty that the remedial action will be protective of human health and remain effective. In addition to technologies which physically remove NAPL, there are other technologies which, while not removing NAPL from the ground, may reduce its mobility in place, thereby immobilizing it. Evaluations of the potential for NAPL recovery or immobilization to be effective are underway but have not been completed specifically with respect to the Montrose Chemical and Del Amo Sites.

Whether and to what degree NAPL recovery and/or NAPL immobilization should occur at the Montrose Chemical and Del Amo Superfund sites will be determined in a separate but related second-phase remedial selection process. As of the date of this ROD, EPA is presently overseeing separate feasibility studies (one for the Montrose Chemical Site, and another for the Del Amo Site) that are examining the feasibility of various NAPL recovery and immobilization alternatives. If EPA determines that an additional remedial action is necessary, EPA will select the second phase remedial actions in an *amendment* to this ROD. EPA may issue such an amendment, if any, as a stand-alone document or within the framework of another ROD for the Montrose and Del Amo Site, including final site-wide ROD(s) which may be issued.

Performance of the second phase remedial selection process for this operable unit is authorized by and consistent with the NCP provision at 40 C.F.R. 300.430(f)(5)(iii)(D) which provides that the ROD shall:

> ...When appropriate, provide a commitment for further analysis and selection of long-term response measures within an appropriate time frame.

The second phase is also in accordance with the *Guidance for Evaluating the Technical Impracticability of Groundwater Restoration* [EPA OSWER Directive 9234.2-25, October 1993], which directs that when waivers of applicable or relevant and appropriate requirements (ARARS) are issued based on technical impracticability in groundwater remedies, EPA should demonstrate:

> ...that contamination sources [in the case of the Joint Site, the NAPL sources] have been identified and have been, or will be, removed and contained to the extent practicable [Section 4.3].

This ROD makes no determination or specification as to NAPL recovery or immobilization, or the feasibility of these actions at these sites, other than to determine that enough NAPL cannot be recovered with existing technologies to reduce contaminant concentrations to drinking water standards at all points in the contaminant distribution (this is further discussed in Section 10 of this ROD).

Both the remedial actions selected in this ROD, and any remedial actions for NAPL recovery or immobilization that may be selected by EPA in ROD amendments subsequently, may be necessary to fully address the principal groundwater-related threat. However, because it will be technically impracticable to recover enough NAPL to reduce groundwater concentrations to drinking water standards in the containment zone, the remedial actions selected in this ROD to isolate the NAPL will be necessary *regardless* of the degree of NAPL recovery or immobilization ultimately selected in the second phase. Because of this, and because the process of evaluating alternatives for NAPL recovery or immobilization is not yet completed, EPA is proceeding with

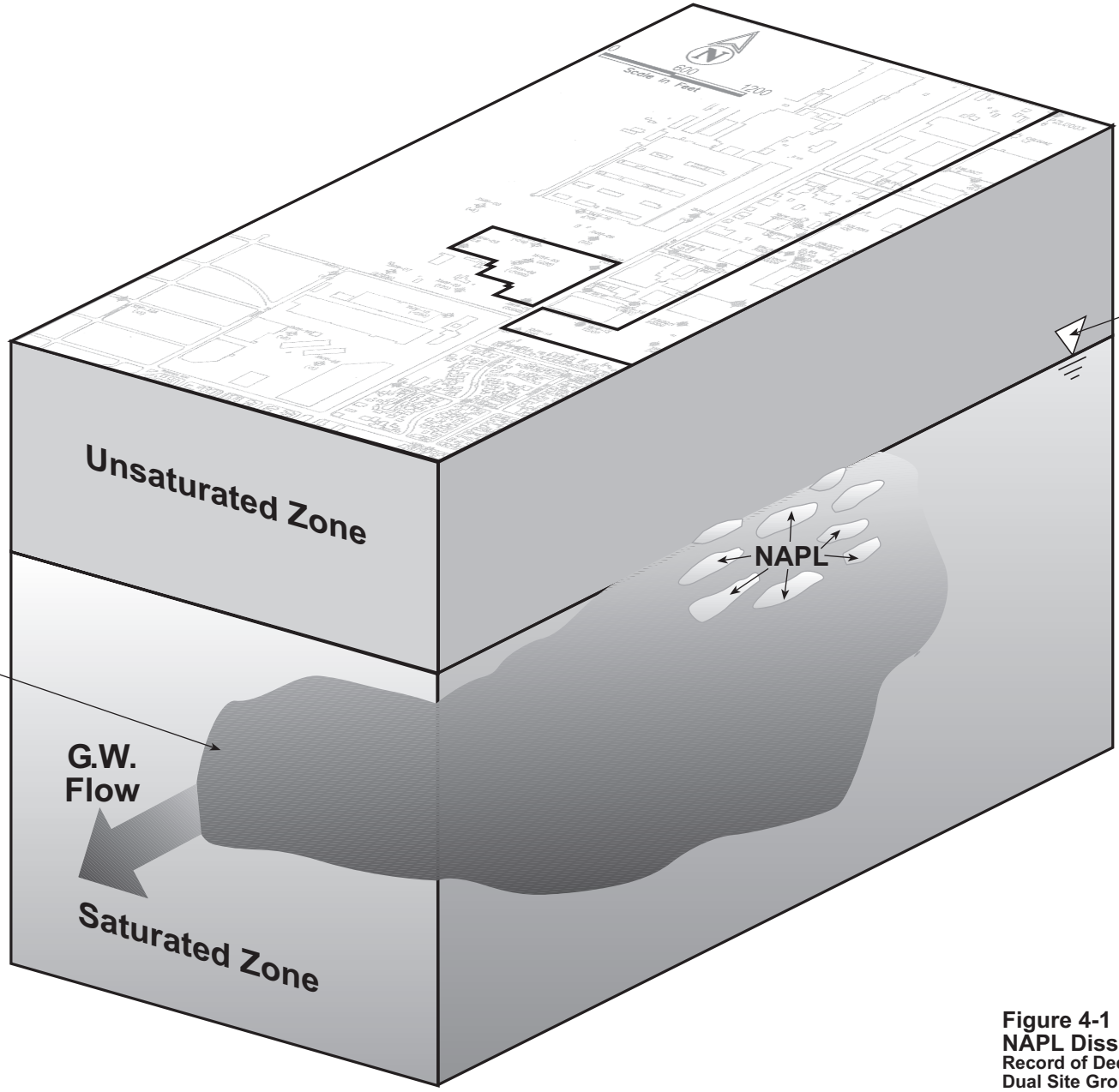
the selection of this remedial action in advance of the completion of the remedy selection process where NAPL recovery and/or immobilization will be addressed.

4.6 Finalization of Del Amo Waste Pits ROD

This ROD finalizes the provisions of the Del Amo Waste Pit remedy that EPA had designated as interim when it issued its ROD for that remedy in 1997. Specifications and details related to this are discussed in Sections 12 and 13 of this ROD.

Table 4-1
Affected Media at the Montrose Chemical and Del Amo Superfund Sites
Record of Decision for Dual Site Groundwater Operable Unit
Montrose Chemical and Del Amo Superfund Sites

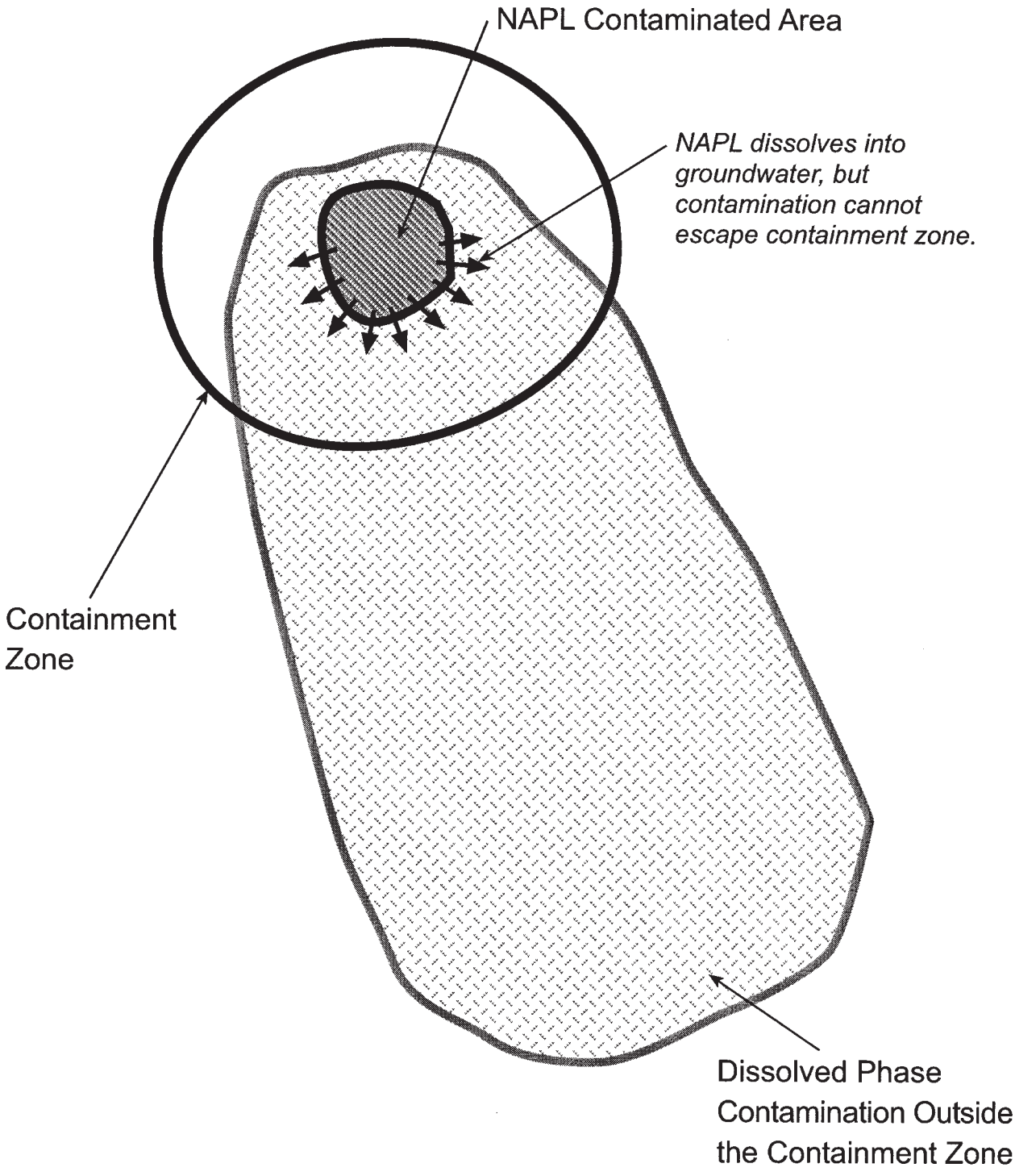
MONTROSE CHEMICAL SUPERFUND SITE	DEL AMO SUPERFUND SITE
Groundwater	Groundwater
NAPL	NAPL
Surface soils on and near the original plant property	Surface Soils on the original plant property
Sediments in existing storm water pathways	Indoor air in businesses
Sediments and soils in neighborhoods contaminated by DDT due to historical surface water pathways and/or aerial dispersion	Del Amo Waste Pits area (separate interim ROD finalized by this ROD)
Sediments in the sanitary sewer system	
DDT-contaminated fill in a neighborhood	
DDT-contaminated sediments on the Pacific Ocean floor	



Conceptual Representation

Figure 4-1
NAPL Dissolution Concept
Record of Decision
Dual Site Groundwater Operable Unit
Montrose and Del Amo Superfund Sites

EPA US EPA Region IX



Conceptual Representation

Figure 4-2
Containment Approach for NAPL and Dissolved Phase
Record of Decision
Dual Site Groundwater Operable Unit
Montrose and Del Amo Superfund Sites

EPA US EPA Region IX